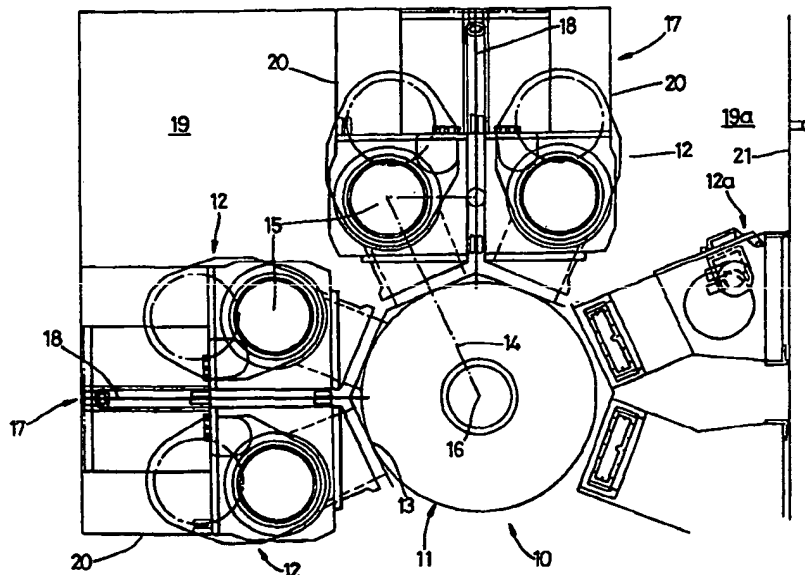




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(54) Title: APPARATUS FOR PROCESSING WORKPIECES



(57) Abstract

This invention relates to an apparatus for processing workpieces (e.g. semiconductor wafers) such as radial cluster tools. A radial cluster tool (10) includes a central loading/unloading station (11) and processing chambers (12). The chambers (12) are arranged in abutting pairs to leave substantial maintenance spaces (19).

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Apparatus for Processing Workpieces

This invention relates to apparatus for processing workpieces (for example semi-conductor wafers) and in particular, but not exclusively, to radial cluster tools.

5 When manufacturing a semi-conductor device on a semi-conductor wafer, it is common to need to process the wafer with successive processes, such as etching and deposition processes, in a common controlled environment, for example under vacuum. It has long been appreciated that consider-
10 able savings can be achieved in production time and cost if the chambers can be arranged around a central wafer load/unload station, which itself is kept at the controlled environment, so that the wafers can be passed from chamber to chamber without the need for a vacuum break or the like.
15 Commonly the chambers are arranged so that the wafer transport axis intersect at a common point and such an arrangement is known as a radial cluster tool. One example of such a tool is illustrated in U.S. Patent No. 5308431.

From time to time the processing chambers will require
20 maintenance, for example the replacement of sputtering targets or shielding. In order to allow access for that maintenance, standard SEMI E26-92 of the Trade Body Semiconductor Equipment and Materials International lays down unoccupied or restricted areas which must exist between the
25 footprint of each module or processing chamber. This significantly limits the number of processing chambers, which can be arranged around a load/unload station of

particular cross section.

From one aspect the present invention consists in apparatus for processing workpieces in a controlled environment, comprising a central workpiece load/unload station
5 having a plurality of processing chambers arranged around the load/unload station so that workpieces can be moved from one processing chamber to another without leaving the controlled environment characterised in that at least two chambers are arranged as a generally abutting pair.

10 In a preferred embodiment the chambers of the pair abut completely. This unequal distribution of chambers enables maintenance access gaps to be provided between pairs and the apparatus includes chambers wherein maintenance access is provided to each chamber through its respective non-abutting
15 side. The chambers are arranged to be substantially fully accessible for maintenance through that access.

It is further preferred that the footprint of each abutting pair and/or the intervening spaces is generally rectangular.

20 Conveniently, with a normal cross sectional dimension of the loading/unloading station, 6 to 8 processing chambers can be included in the apparatus, the chambers being arranged in pairs.

Preferably the apparatus is in a form of a radial
25 cluster tool in which case the workpiece transport axes may be equally disposed around their point of intersection.

Although the invention has been defined above, it is to be understood it includes any inventive combination of the

features set out above or in the following description.

The invention can be performed in various ways and this specific embodiment will now be described by way of example with reference to the accompanying drawing which is a plan
5 view of processing apparatus.

A radial cluster tool is generally illustrated at 10, and comprises a central loading/unloading station 11, processing chambers 12 and vacuum load lock/cassette elevators 12a. Load locks 12a provide communication through
10 the clean room wall 21.

The load/unload station 4 includes a wafer or other workpiece transfer mechanism (not shown), for example of the type illustrated and described in U.S. Patent No. 5308431. This is arranged to load and unload workpieces through the
15 respective gate valves 13 into the processing chambers 12 along transfer paths, such as illustrated at 14. It will be noted that the process position, 15, of each chamber 12 lies on a circle about the point of intersection of the transfer paths 14. In this sense the layout is entirely conven-
20 tional.

However, by configuring the processing chambers 12 in rectangular modules, it is possible to arrange them in pairs 17 so that their adjacent walls 18 are abutted. In this way the pairs 17 have a very compact rectangular footprint and
25 the result is that substantial maintenance spaces 19 are provided between the abutting pairs 17. The arrangement is particularly advantageous in that it allows a maintenance space 19a adjacent the clean wall 21, which is simply not

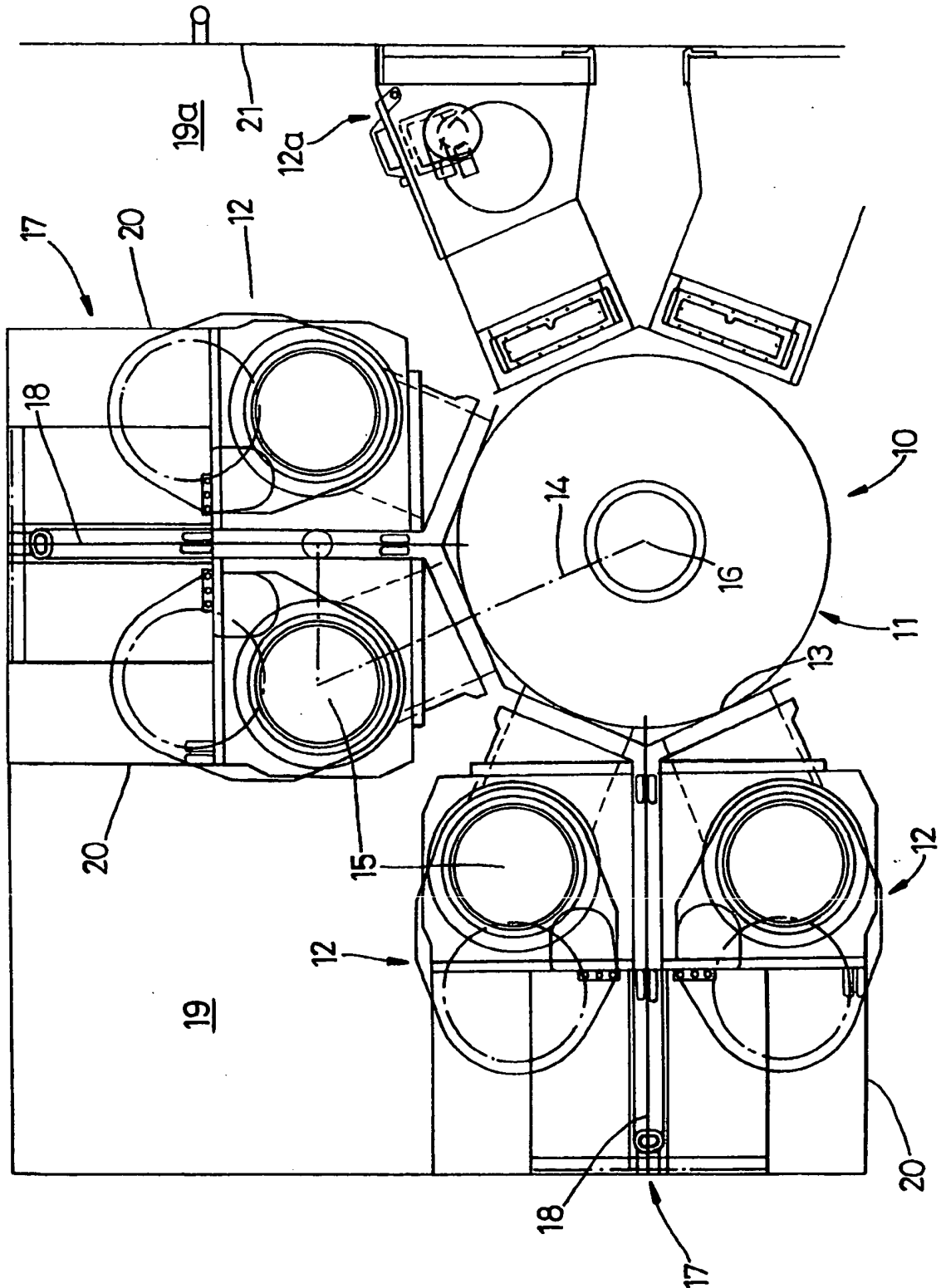
available with a radial configuration. Each processing chamber 12 is formed with an access along its wall 20, which opens onto the maintenance space 18 and the chambers 12 are configured so that all necessary maintenance can be achieved
5 through that access.

In the previous arrangement, the lack of maintenance space tended to limit the number of chambers, now for the same chamber dimensions more than six chambers can readily be accommodated, whilst providing a good maintenance access.

Claims

1. Apparatus for processing workpieces in a controlled environment comprising a central workpiece load/unload station having a plurality of processing chambers arrange
5 around the load/unload station so that workpieces can be moved from one processing chamber to another without leaving the controlled environment characterised in that at least two chambers are arranged as a generally abutting pair.
2. Apparatus as claimed in claim 1 wherein there is a
10 plurality of abutting pairs.
3. Apparatus as claimed in claim 2 wherein maintenance access is provided to each chamber through its respective non abutting side and wherein the chamber is substantially fully accessible for maintenance through that access.
- 15 4. Apparatus as claimed in claim 2 or claim 3 wherein the footprint of each abutting pair is generally rectangular.
5. Apparatus as claimed in any one of the claims 4 to 6 including 6 or 8 processing chambers arranged in pairs.
6. Apparatus as claimed in any one of the preceding claims
20 wherein the apparatus is a radial cluster tool.
7. Apparatus as claimed in claim 6 wherein the workpiece transports axes are equally disposed around their point of intersection.

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INTERNATIONAL SEARCH REPORT

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PCT/GB 98/01859

A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 675 563 A (METREAU CLAUDE G) 11 July 1972 see column 2, line 45 - line 70 see column 7, line 1 - line 14; claim 1; figure 1	1, 2, 4-7
X	US 4 825 808 A (TAKAHASHI NOBUYUKI ET AL) 2 May 1989 see the whole document	1-5
X	US 4 544 318 A (NAGATOMO HIROTO ET AL) 1 October 1985 see column 4, line 27 - line 41; figure 4	1, 2, 4



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Information on patent family members

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